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# A Web-Based Nuclear Criticality Safety Bibliographic Database

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## A WEB-BASED NUCLEAR CRITICALITY SAFETY BIBLIOGRAPHIC DATABASE

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A bibliographic criticality safety database of over 13,000 records is available on the Internet as part of the U.S. Department of Energy's (DOE) Nuclear Criticality Safety Program (NCSP) website. This database is easy to access via the Internet and gets substantial daily usage. This database and other criticality safety resources are available at [ncsp.llnl.gov](http://ncsp.llnl.gov). The web database has evolved from more than thirty years of effort at Lawrence Livermore National Laboratory (LLNL), beginning with compilations of critical experiment reports and American Nuclear Society Transactions.

The database enables users worldwide to locate nuclear criticality publications including, for example:

- Critical and subcritical experiments and their use in code validation
- Criticality accidents & emergency response
- Criticality standards & methodology
- Evaluation methods including computer codes or hand calculations
- Nuclear criticality safety theory and practice
- Evaluations of the International Criticality Safety Benchmark Evaluation Project (ICSBEP)

The bibliography began as a critical experiment bibliographic database at LLNL and was initially published in hardcopy format in 1979 as UCRL-52769. In 1982 a compilation was issued of summaries of criticality safety papers published in the Transactions of the American Nuclear Society (UCRL-53369). The database has been very much expanded from the initial 1067 records to now contain over 13,000 reports, journal articles, standards, conference papers, patents, etc. In order to simplify our present discussion we may refer to such documents simply as "reports."

Searching other general bibliographic online resources has been helpful in expanding the criticality database. Still, a very important method of obtaining bibliographic records involves use of reference lists in documents such as:

- *Critical Dimensions of Systems Containing  $^{235}\text{U}$ ,  $^{239}\text{Pu}$ , and  $^{233}\text{U}$* , (LA-10860), *Nuclear Criticality Safety Guide* (LA-12808), and *A Review of Criticality Accidents*, (LA-13638).
- Conference proceedings such as the United Nations International Conferences on the Peaceful Uses of Atomic Energy, American Nuclear Society meetings, and the International Conferences on Nuclear Criticality Safety (ICNC).
- Technical journals such as, *Nuclear Science & Engineering* and *Nuclear Technology*.
- "Vintage reports" published in the 1940s and 1950s. Some of these reports had been preserved in hardcopy format at LLNL and others were located by review of *Nuclear Science Abstracts*.
- Interim reports and memoranda from various sites

- International Criticality Safety Benchmark Evaluation Project (ICSBEP) critical experiment benchmarks. The experiment summaries are included as abstracts in the bibliographic database
- The ICSBPEP evaluations were also examined to ensure that the reports referenced in each evaluation are also included the bibliographic database

The yearly publication rate of records in the NCSP bibliographic database is illustrated in Figure 1. The publication rate began a quick rise in the early years of the criticality safety discipline. The rate was rather stable for several decades before an increase in the 1990s. A part of this increase would have been due to the addition in this time period of many of the ICSBEP evaluations, three ICNC conferences, and some ANS Topical Meetings. The apparent decline in the first decade of the second millennium is likely just due to the fact that many recent reports still need to be identified and acquired.

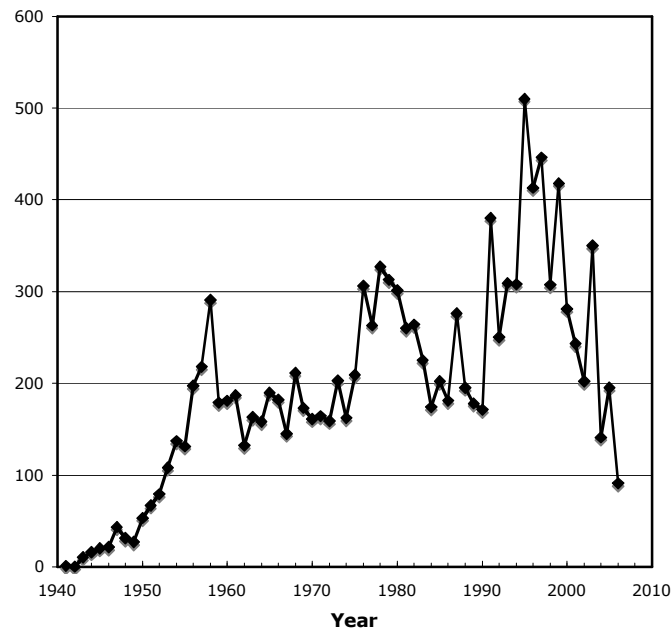


Figure 1. Publication frequency of reports in the NCSC bibliographic database

Many papers were presented at the ICNC conferences. TABLE I gives a summary of the papers included in the database from the past conferences. The conference in 1983 was the first of the ICNC conference series and, as far as we are aware, proceedings were not published. The papers that are included in the NCSP database for the 1983 conference were those published as company reports prior to submission for presentation at conference.

TABLE I. Database Records Obtained from ICNC Conferences

Year	Papers
1983	10
1987	86
1991	102
1995	145
1999	198
2003	162
<b>Total</b>	<b>703</b>

There were several international conferences prior to the ICNC series that provided papers for the database. Some of these are displayed in TABLE II. For some conferences the number of papers in the database is small relative to the number of papers presented at the conference. Initially, we included papers that could provide benchmark data for code validation. We thus still need to obtain the conference proceedings and add the missing papers.

TABLE II. Some Early International Conferences

Conference	Papers
First United Nations International Conference on the Peaceful Uses of Atomic Energy, Geneva, Switzerland, 8-20 August 1955	16
Second United Nations International Conference on the Peaceful Uses of Atomic Energy, Geneva, Switzerland, 1-13, September 1958	77
Third United Nations International Conference on the Peaceful Uses of Atomic Energy, Geneva, Switzerland, 31 August-9 September 1964	9
Symposium on Criticality Control of Fissile Materials Held by the International Atomic Energy Agency at Stockholm, 1-5 November 1965	47
Symposium on Exponential and Critical Experiments Held by the International Atomic Energy Agency in Amsterdam, Netherlands, 2-6 September 1963	7

A major contribution to the database has been provided by publications of the American Nuclear Society including ANS Transaction summaries, journal papers, and conference papers. These are summarized in TABLE III.

TABLE III. American Nuclear Society Publications Present in the Database

Publication	Papers
ANS Transactions	2243
Nuclear Science & Engineering	380
Nuclear Applications & Nuclear Technology	261
Topical Meeting Proceedings	336
<b>Total</b>	<b>3220</b>

Most of the report titles are in English or have been translated from their original languages into English, but some are in their original language. The database includes reports from many countries but the authors believe the database is presently limited in its international coverage.

We now provide online links to over 900 full-text documents. Additional links will be added as they become available. We will also expand the full-text resources via scanned reports from the hardcopy collection at LLNL. Having links to reports produced by the now-closed critical experiment facilities will supplement the effort to archive critical experiment records and will facilitate preparation of benchmark models of past experiments. This effort, of course, is subject to copyright and other limitations on distribution; restricted reports will not be included without permission of the originators.

We would appreciate help from the user community to improve and expand the bibliographic database. If individuals or organizations have bibliographic databases (or even printed bibliographies) they are willing to share, it is very much encouraged. It would be helpful if we would be included on distribution lists for reports dealing with nuclear criticality. The authors can be reached via e-mail at the addresses provided above. Another contact is the head of the LLNL Criticality Safety Section, David Heinrichs ([heinrichs1@llnl.gov](mailto:heinrichs1@llnl.gov)). Contact information regarding the NCSP web site is available online at [ncsp.llnl.gov](http://ncsp.llnl.gov). Our address for standard mail is:

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